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September 8, 1995

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
Room 222
1919 M Street NW
Washington DC 20554

DOCKET FILE COPY ORIGINAL

Re: Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules, CC Docket No. 92-297

Dear Mr. Caton:

On behalf of Endgate Corporation ("Endgate"), I enclose for filing with the Commission the original and nine copies of Endgate's Comments in the above-referenced proceeding. Also enclosed is the original and nine copies of Motion of Endgate Corporation For Leave To File Comments One Day Out of Time.

Because of time constraints, the enclosed original bears a facsimile signature. I will refile the document with an ink signature as soon as it is available.

Kindly date-stamp and return the extra copy of this submission.

If there are any questions about this filing, please call me at the number above.

Respectfully submitted,

Mitchell Lazarus

Enclosures

cc: Mr. Tom Smith
Endgate Corporation

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List A B C D E

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington DC 20554

In the Matter of	)	
	)	
Rulemaking to Amend	)	CC Docket No. 92-297
Parts 1, 2, 21, and 25	)	
of the Commission's Rules	)	

MOTION OF ENDGATE CORPORATION FOR LEAVE TO FILE COMMENTS ONE DAY OUT OF TIME

1. Endgate Corporation ("Endgate") respectfully moves the Commission for leave to file the attached comments one day beyond the due date.[1/] Endgate is a leading manufacturer of 28 GHz equipment. Endgate has been active in earlier stages of this proceeding and participated in the LMDS/FCC 28 GHz Band Negotiated Rulemaking Committee.[2/]

2. The present delay is occasioned by Endgate's efforts to coordinate its filing with that of another party. For reasons outside Endgate's control, certain differences in position became apparent only yesterday. Endgate worked with the other party until the eleventh hour -- in point of fact, somewhat beyond the twelfth hour -- but despite its best efforts was unable to reach a resolution in time to file yesterday. Although not fully achieved in this instance, Endgate's goal was consistent with

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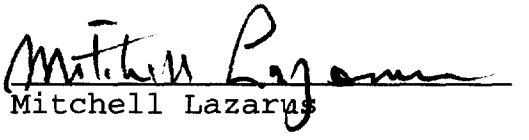
1/ Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules, CC Docket No. 92-297, Third Notice of Proposed Rulemaking and Supplemental Tentative Decision, FCC 95-287 (released July 28, 1995) ("Third Notice"). The due date for Comments was subsequently extended to September 7, 1995. Order, DA 95-1866 (released Aug. 25, 1995).

2/ See Third Notice, Appendix A.

Commission policy: to increase policy coordination within the industry and hence to reduce the regulatory burden.

3. No party will be significantly prejudiced by a grant of this motion.

Respectfully submitted,



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In the Matter of	)	
	)	
Rulemaking to Amend	)	**CC Docket No. 92-297**
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COMMENTS OF ENDGATE CORPORATION

Endgate Corporation hereby submits the foregoing comments to the third NPRM in the above captioned proceeding. Endgate's comments are organized by NPRM paragraph number.

Paragraph 47. In that FSS systems would be permitted to operate limited "gateway" type services in the 27.5 to 28.35 band on a secondary basis, Endgate believes it would be appropriate to require the FSS system operator to notify the existing LMDS operator of his intention to install a "gateway" station and to coordinate with the LMDS operator to prove non-interference before the installation.

Paragraph 48. From an equipment manufacturer's point of view Endgate sees no particular advantage to relegating LMDS to the lower half of the 28 GHz band nor to the upper. However, Endgate does concur with Texas Instruments and Hewlett-Packard in noting that a non-contiguous segment of the band would be desirable for isolating at least some of the inbound, subscriber channels from the outbound channels. Endgate believes that the rules should promote maximum flexibility without interference. It should be incumbent upon each service provider to employ a technically efficient implementation of his system that does not radiate power at excessive levels or into areas not served. The proposed co-primary band segment at 29.1 to 29.25 GHz would be a positive step in this direction if it were truly co-primary and subscribers were permitted to transmit in the band. Co-primary status should result in each service provider sharing the band to bear an equal share of the burden in eliminating mutual interference. In a

similar manner shared spectrum could be more commensurate if LMDS were granted secondary status in some of the bands where GSO/FSS is designated as primary.

Paragraph 60. The agreement reached by several parties, although a logical basis for proposed rulemaking, cannot be considered to be universally appropriate. The proposed operating restrictions are decidedly one-sided in favor of the MSS licensee and render the 29.1 to 29.25 GHz band segment of little use to the LMDS licensee. Particularly onerous is the restriction on subscribers from transmitting in this band whether or not there is any potential or actual interference. It is also difficult to understand why this restriction should apply in MSAs where no MSS feeder link earth stations exist or are planned. Given the split in the 1 GHz of spectrum proposed for LMDS, the band from 29.1 to 29.25 GHz could be used in two-way systems for the return channels of at least some subscriber transceivers. This portion of the band is further ideal for those subscriber return channels that will be low power and narrow band.

From the MSS operator's viewpoint interference from these subscriber transceivers should be of no consequence. Only those subscriber transceivers directly illuminating an overflying satellite may potentially cause interference depending on their EIRP, and that can be controlled by the LMDS operator in several ways. For example, subscriber transceivers pointing along the satellite flight path could be predominately restricted to low EIRP channels located close-in to the hub and/or their transmissions could be muted by the controlling hub during periods of satellite overflight. Subscribers requiring higher EIRP transceivers and at greater distances from the nominal hub could be routed to an adjacent hub in a direction at a large angle to the satellite flight path.

Paragraph 63. Endgate wholeheartedly supports the suggestion by Texas Instruments that a number of techniques, such as hub control of subscriber link transmissions and adaptive/graduated power control, can be employed to mitigate any interference caused by LMDS customer transceivers. Additionally,

satellite flyby times are predictable and can be employed by hubs within the satellite's footprint to suspend transmissions from potentially interfering customer transceivers during that flyby time.

The narrow beamwidth (~ 2°) and the specific, radially inward boresight of the customers' transceiver antennas already minimize their aggregate illumination of the satellite. Only one sector out of the 36 envisioned by Endgate for each hub would contain customer transceivers directly or partially oriented toward the approaching satellite. Of these the transceivers in cells closest to the satellite would have the greatest potential for interference power at the satellite by virtue or their shorter path but only if they were pointed directly at the satellite. This situation is self mitigating in that customer transceivers in the closest cells to the satellite would have such a low elevation angle (approximately pointed at the horizon) that they would not illuminate the on-coming satellite; and those which would, do so over a long slant-range, highly attenuating path through the atmosphere. In conditions of heavy rain and/or atmospheric disturbance, both the LMDS customer transceivers and the MSS feeder link signals are likely to be so highly attenuated over the low elevation angle path through the atmosphere that they will be invisible to each other. In any event interference from those subscribers whose antennas are oriented along the MSS ground track can be controlled by restricting their elevation angles and transmitted power.

The preliminary analysis, NRMC-21, by Harry Ng illustrated the improvement in C/I achievable by increasing the MSS feeder link elevation angle to 10° or higher and by constraining the LMDS antenna shape factors to reduce radiation at positive elevation angles from both the main lobe and the sidelobes. (Though not proposed by Harry, another degree of freedom available to the MSS uplink is the ability to set its EIRP at a level equivalent to 10 to 15 dB over that currently proposed for the Motorola *Iridium* system.) Endgate recommends that these and other sharing methods be fully considered and included in the rulemaking so that two-way LMDS operations are permitted in the band shared with MSS feeder links and so that overall LMDS use of the shared band is not unduly restricted . The alternative, given the

proposed rulemaking, is to be forced to employ an underpowered, narrow spectrum hub with no return capability in the upper band. Given the fact that the rules as proposed would limit LMDS operations so severely; and, taking account of all possible mitigating approaches, it is clear that increasing the power of the MSS uplink and allowing return link operations under the conditions described above would be the most cost effective and least intrusive means of providing an equitable sharing of the 29.1 to 29.25 GHz band by LMDS and MSS feeder links.

Furthermore, Endgate continues to believe that sharing between LMDS and FSS uplinks in other portions of the 28 GHz band is feasible if proper technical means are employed (e.g. TDMA, CDMA and other real time intersystem coordination techniques). For this reason Endgate urges the Commission not to preclude the possibility of secondary, or in the future co-primary, LMDS/FSS operations across the entire 28 GHz band.

Paragraph 76. Endgate believes that geographic partitioning and spectrum disaggregation are desirable means of providing flexibility in the operation of LMDS systems requiring less than 1 GHz of spectrum. For this reason Endgate applauds the Commission's proposal in this regard. Endgate wishes to point out that the same geographic partitioning and spectrum disaggregation rules should be applied to FSS operators in the 28 GHz band. Endgate implores the Commission not to limit application of the proposed rule solely to LMDS.

Paragraph 78. The long-term economic viability of LMDS will depend on the deployment of digital technology. Since the proposed authorized spectrum can only support 42 FM analog video forward channels; and, given its higher cost, analog LMDS can hardly be competitive with existing cable or MMDS systems. The underlying strength and appeal of LMDS is its potential bandwidth which can provide for a variety of one-way and two-way services. In order to compete LMDS must offer broadcast

channels plus video-on-demand to even approach parity with cable systems and in addition must live up to its potential for two-way high speed data which can include computer data exchange, business and professional television, videoconferencing, videomedicine, etc. The demand for video/data services will undoubtedly grow as fast as the technology permits and absorb any additional capacity created by technology advancement. Therefore it is clear that LMDS requires a minimum of 1 GHz of spectrum.

Paragraph 117. Endgate has supplied LMDS equipment for field trials in conjunction with Video/Phone Systems, Inc. and is planning to be an equipment provider if and when the service is authorized and licensed. Endgate concurs with the proposed time periods for system build-out.

Paragraph 118. Endgate concurs with the proposal to adopt standards to the extent that they are narrowly tailored to those that will facilitate coordination between geographically adjacent LMDS systems and between LMDS and MSS feeder link facilities where they share spectrum. In addition Endgate requests that antenna polarization not be standardized or restricted since some degree of flexibility will be needed to overcome obstructions in the cell environment.

Paragraph 120. Endgate agrees with the proposal that applicants should coordinate frequencies and other interference issues at their service boundaries. As for a reasonable PFD at service area boundaries, Endgate believes that no universal PFD can be reasonable for all situations because of the great variety in topography to be expected at service area boundaries. Mountains, hills, heavily foliated areas, etc. will have a profound effect on the interference situation at boundaries. Endgate believes that private coordination between affected parties is the best way to preclude interference between adjacent LMDS operators while maintaining the highest level of operational flexibility.

Paragraph 121. Because of the variability of interference situations possible, Endgate recommends that no universal restriction on signal polarization be established except that it be compatible among adjacent LMDS or MSS service providers. Agreement between service providers to employ orthogonal linear polarizations at their mutual boundary may be a desirable means to eliminating mutual interference but so would use of orthogonal circular polarizations. Circular polarization may actually be superior to linear polarization in maintaining polarization isolation through heavy foliage. Endgate has initiated some preliminary research into this area and plans to continue its study and experiments in the future. Consequently, Endgate believes the issue of polarizations available for LMDS should be left open to be coordinated by LMDS operators at their service boundaries and to be the subject of further experimentation.

In areas where interference between LMDS systems and MSS feeder links is potentially significant, the use of the orthogonal circular polarization to that of the feeder link would provide the greatest isolation. As was previously mentioned, the theoretical isolation between linear and circular polarizations is only 3 dB.

Paragraph 122. Endgate recommends most strongly that the maximum EIRP for the 27.5 to 28.35 GHz band be maintained at -18 dBW/Hz, particularly since there is no cogent or technical reason for limiting it to a lower level than the current domestic and international regulations provide for. As a participant in the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee, Endgate submitted system parameters indicating its intent to employ much higher power levels than that indicated in this NPRM. Specifically, Endgate stated the requirement for hub EIRPs of +47 dBW to +55 dBW or -43 dBW/Hz to -35 dBW/Hz in the following documents:

- "Power Limits and Power Density Limits for FSS and LMDS Transmitting Stations", JTSG/4.11 (rev. 2), 8/18/94
- "Report of the WG1B Ad Hoc Modeling and Analysis Group", WG1/44, (18 August 1994)
- "Video/Phone Draft-Technical Characteristics of 20/30 Terrestrial Systems", Document No. WG1/24 (Rev. 1), WG2/24 (Rev.1), 8/8/94
- "Preliminary Sharing Analysis", WG2/38 (Rev 1), 8/18/94

Additionally Texas Instruments in WG1/39 & WG2/39, 17 Aug 94 implied its intention to field hubs soon with an EIRP of +45 dBW or -45 dBW/Hz.

The proposed limit of -52 dBW/Hz appears impractical for many, if not all, of the proposed systems. A realistic example illustrates this:

Assumptions:

- 240 video channels of 3.5 MHz each (Note: this is a conservative estimate based on 1 bps/Hz)
- 3 miles cell radius
- Rain rate of 51 mm/hr for 99.99% availability

Calculation:

- +13.4 dBW/ channel for -52 dBW/Hz PSD
- -135 dB path loss for 3 miles clear air
- -29.6 dB loss for 51 mm/hr rain
- 38 dBi receive antenna gain
- -113.2 dBW receive signal level
- -131.6 dBW noise level including receiver noise figure and antenna noise

- 18.4 dB carrier to noise ratio which is adequate for QPSK modulation with approximately 4 dB of margin for implementation errors, etc.

The above link analysis is adequate for a clear air transmission path in moderate rain but is completely inadequate for paths through trees, particularly under windy conditions. Depending on the heights of the transmitting and receiving antennas relative to the tree height, an additional margin of up to 50 dB is required. This fact is based on a recent field trial in a typical suburban environment where very limited line-of-sight conditions prevailed.

Paragraph 123. Endgate again recommends that the maximum EIRP for LMDS be maintained at -18 dBW/Hz and not be limited to -52 dBW/Hz in the 27.5 to 28.35 GHz band. Based on the data obtained in a recent field trial, the -52 dBW/Hz limit will permit only line-of-sight coverage in normal foliated environments and will not provide adequate coverage to justify the system economically. Advantage should be taken of higher power spectral density in cases where it is necessary to deal with foliage blockage and inter- and intra-system interference.

In the 29.1 to 29.25 GHz band Endgate recommends increasing the EIRP spectral area density from the current range of -26 to -23 dBW/Hz-km^2 to +20 dBW/Hz-km^2 in any azimuthal direction. This increased level will permit simultaneous LMDS hub and customer transceiver operation within the band. The level of potential interference is mitigated by the fact that no more than one customer transceiver per cell will be oriented toward a satellite and transmitting at the same time on the same frequency. In addition any hub or subscriber transceiver whose antenna is pointed along the overflying satellite's path will be at a low elevation angle and can be restricted to a lower EIRP and/or be reduced in power during the satellite's overflight.

Furthermore and more importantly, the EIRP level that an LMDS operation is permitted to utilize is directly related to the amount of capacity it can provide to the public. As Endgate explained in detail during the 28 GHz Negotiated Rule Making Committee meetings, higher output power can be utilized in many ways in LMDS networks, among which include dramatic increases in transmission capacity. For example, an increase in power will provide the higher carrier-to-noise ratio on a given link necessary to support a higher order of modulation and a higher bit rate because of the greater number of bits per symbol of the higher order modulation scheme. More specifically, upgrading to 16QAM from QPSK can double the bit rate and maintain the same bit error level by increasing the power approximately 7 dB.

Paragraph 124. A minimum spectral efficiency of 1.0 bps/Hz for digitally modulated systems is certainly appropriate as discussed above and will not present any problems to Endgate as an equipment manufacturer. Endgate envisions a practical spectral efficiency for initially deployed LMDS systems of between 1.0 and 1.5 bps/Hz based upon QPSK modulation with some forward error correction. Higher bps/Hz will be possible in later deployments particularly if the Commission does not approve the unreasonably low power limits proposed in the NPRM.

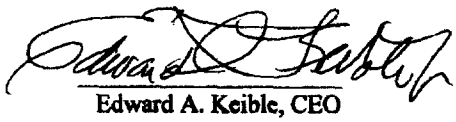
Appendix B, #21.1022 Power Reduction Techniques.

This proposed rule is technically unnecessary and frivolous since adherence to whatever EIRP spectral density limits are ultimately established for sections 21.1020 and 21.1021 will be totally sufficient to control LMDS emissions in the shared LMDS/MSS band. Specification of the manner in which power control is achieved serves to create exactly the kind of excessive and extraneous regulation that the Commission, the Clinton administration, and many others are working hard to eliminate. Furthermore, the complicated web of rules and restrictions for LMDS presented in the proposed sections 21.1020 through 21.1022 are extremely one-sided and hardly constitute a co-primary status. The MSS operator has virtually no restrictions except for the total number of feeder stations allowed. The number

authorized is far beyond that planned for the immediate future and essentially accommodates all future expansion. For this reason all MSS operators should be required to operate their feeder uplink stations at EIRPs 10 to 15 dB above that proposed by Motorola for their Iridium uplink stations.

Endgate is pleased that the Commission is moving the proceeding ahead and respectfully requests that the Commission carefully considers the comments presented herein.

Respectfully submitted,



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